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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/476,669	12/30/1999	GORLEY L. LAU	5298-03500-P	8129

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EXAMINER
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CANTELMO, GREGG

ART UNIT	PAPER NUMBER
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1753

16

DATE MAILED: 03/06/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/476,669

Applicant(s)

LAU, GORLEY L.

Examiner

Gregg Cantelmo

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1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 January 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 and 22-30 is/are pending in the application.
- 4a) Of the above claim(s) 24-29 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-18, 22 and 23 is/are allowed.
- 6) ☒ Claim(s) 1-11 and 30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

**DETAILED ACTION**

***Request for Continued Examination Under 37 CFR 1.17(e)***

1. The RCE received January 28, 2002 has been received and entered. An action on the merits of the claims is as follows.

***Response to Amendment***

2. In response to the amendment received December 20, 2001, entered via the RCE request January 28, 2002:
  - a. Claims 1-18 and 22-30 are pending;
  - b. The restriction of claim 30 has been withdrawn in light of Applicants Arguments. An action on the merits of claim 30 is set forth below. However claims 24-29 are still restricted by original presentation as discussed more clearly below.
  - c. Grounds of rejection are set forth below.

***Election/Restrictions***

3. Newly submitted claims 24-29 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: these new claims are drawn to application of a backside gas to the topography of the substrate which is not a feature originally claimed in those claims which received action on the merits.

Claims 1-18 and 30 are different in scope with respect to claims 24-29. The invention of claims 24-29 differ in that the significance appears to lay in the backside gas limitations. Claims 1-18 and 30 fail to recite such a feature.

37 CFR 1.145. Subsequent presentation of claims for different invention. If, after an office action on an application, the applicant presents claims directed to an invention distinct from and independent of the invention previously claimed, the applicant will be required to restrict the claims to the invention previously claimed if the amendment is entered. The backside gas limitations present an invention, which is distinct, and independent from the original claims and thus provides grounds for restriction.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 24-29 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

#### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-11 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for applying a bias power sufficient to splash deposited metal during IMP deposition, does not reasonably provide enablement for

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applying the bias at least partly during said ion metal plasma depositing of the wetting layer. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. The portion of the specification which applicant refers to for support for the limitations identified above does not appear to have support for a partial application of the bias power sufficient for splashing deposited material in the manner recited in the claim. Unless Applicant can provide clearer evidence for support for the specific language employed in claim 1, the Examiner suggests that the term "at least partly" be deleted from claim 1.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 6,156,645 (Geha) in view of Rossnagel et al. "Metal ion deposition from ionized magnetron sputtering discharge" (hereafter referred to as Rossnagel).

Geha discloses a method for fabricating a metallization structure, comprising:

Etching a cavity comprising a base and opposing sidewalls within a dielectric layer 502 of a topography (Fig. 5 and col. 12, ll. 42-45). Depositing a wetting layer 504a consisting essentially of titanium in contact with the base and sidewalls of the cavity and

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sputter depositing an entirety of a bulk metallization layer 504b on and in contact with the wetting layer 504a (Fig. 5, col. 12, ll. 45-48 and prior art claims 1-3 and 6).

The difference between the instant claims and Geha is that Geha does not explicitly disclose IMP depositing the wetting layer 504a (claim 30).

According to Geha, the invention can improve any process for forming a wetting layer. For example, increasing the process temperature in accordance with the invention during either collimated or IMP deposition improves the quality of the deposited wetting layer, thereby enabling formation of more problematic metal layers (e.g., filling of high aspect ratio vias) and/or enlargement of the process window for the formation of the wetting layer or subsequent formation of the wetting layer.

Geha then recognized or appreciated that the step of forming the wetting layer of Geha can be formed by IMP deposition.

The motivation for using IMP deposition is to enhance the directionality of the metal ions towards the substrate. A primary application being to improve the lining and filling of semiconductor trenches and vias (Rossnagel abstract).

The motivation for IMP depositing the wetting layer is to enhance the directional control of the metal ions thereby improving and enhancing coating of high aspect ratio vias and trenches formed in a semiconductor substrate.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Geha by using IMP deposition when forming the wetting layer since it would have enhanced the directional

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control of the metal ions and thereby improved and enhanced coating of high aspect ratio vias and trenches formed in a semiconductor substrate.

***Allowable Subject Matter***

8. Claims 12-18 and 22-23 are allowed.

9. The following is an examiner's statement of reasons for allowance: none of the prior art of record is considered to teach, suggest or render obvious the invention of claim 12.

In particular while IMP deposition of titanium is known in the art for forming wetting layers (see Geha) and subsequent deposition of aluminum at different process temperatures, Geha teaches of a first cold deposition step and subsequent hot deposition for the aluminum metallization. Geha does not teach suggest or render obvious the particular aluminum metallization deposition steps wherein the third portion is deposited at a temperature lower than the second deposition temperature of the second deposition portion.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on (703) 308-3322.

FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

gc

March 4, 2002

  
RODNEY G. MCDONALD  
PRIMARY EXAMINER